3.5 Water Quality

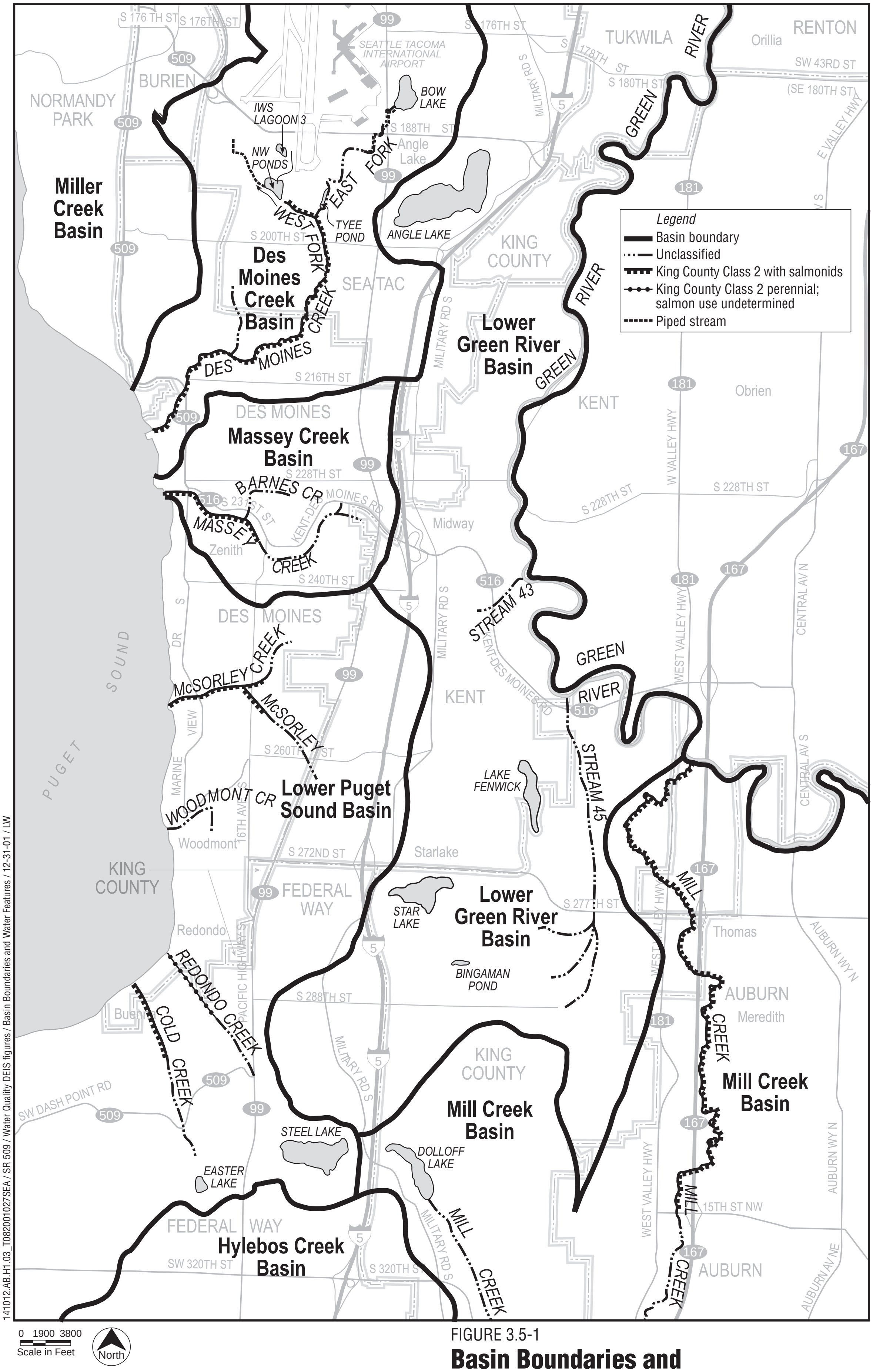
3.5 Water Quality

3.5.1 Studies and Coordination

This section is based on the findings of the *SR 509/South Access Road EIS Discipline Report: Water Quality* (CH2M HILL August 2000), *SR 509*/*South Access Road EIS: South Airport Link* (August 2001a), and *SR 509*/*South Access Road EIS: I-5 Improvements Report* (CH2M HILL October 2001). These discipline reports evaluated previous technical studies, engineering reports, basin plans, and topographic and natural resource maps to assess resources that could be affected by the proposed project. Identifying and evaluating potential impacts resulting from the proposed project alternatives also required coordinating with project consultants and representatives from natural resource management and regulatory agencies. The following agencies and jurisdictions were contacted during preparation of this Revised DEIS:

- U.S. EPA, Seattle Office, Region 10
- Washington State Department of Ecology (Ecology), Northwest Regional Office, Bellevue
- WSDOT
- King County Department of Natural Resources, Water and Land Resources Division
- King County Department of Metropolitan Services
- Highline Water Department
- City of Federal Way, Water and Sewer Department
- City of Des Moines, Public Works Department
- City of SeaTac, Public Works Department
- Port of Seattle

For this analysis, the project area includes all basins or watersheds potentially affected by this project (Figure 3.5-1). Information on drainage patterns, riparian land uses, riparian conditions, channel conditions, and hydrology in the project vicinity was augmented by field observations made during a jurisdictional wetland delineation and stream reconnaissance investigation. No water quality or flow data were collected.



141012.AB.H1.03_T082001027SEA / SR 509 / Water Quality DEIS figures / Basin Boundaries and Water Features / 12-31-01 / LW

FIGURE 3.5-1

Basin Boundaries and Water Features

SR 509: Corridor Completion/I-5/South Access Road Environmental Impact Statement

Construction impacts on water quality were assessed by evaluating the proposed project alternatives' potential to increase erosion, sedimentation, stormwater, and other construction-related pollutants above existing conditions. Potential increases in construction-related erosion, sedimentation, stormwater, and pollutant loading are typically short term and generally decrease substantially after construction activities are completed. It was assumed that potential water quality impacts would be negligible in those basins that would not receive stormwater runoff from the proposed project. Therefore, potential construction impacts on surface water and groundwater quality were evaluated only for those water bodies expected to receive stormwater from construction sites.

Potential operational or long-term effects on surface waters were evaluated based on estimated average annual pollutant loads to receiving waters from the build alternatives. The FHWA design procedure (FHWA April 1990a, April 1990b), which has been adopted by WSDOT, was used to make the evaluation. The FHWA procedure is a probabilistic dilution model developed and applied in EPA's Nationwide Urban Runoff Program (NURP). The magnitude and frequency of occurrence of in-stream concentrations of a pollutant produced by stormwater runoff were computed as a basis for comparing the proposed alternatives. For each of the surface water basins affected by the proposed project alternatives, pollutant loadings were estimated for total suspended solids (TSS), chemical oxygen demand (COD), zinc, copper, nitrate/nitrite, total Kjeldahl nitrogen (TKN), and total phosphorus (TP). By examining each basin separately, impacts on surrounding resources could be assessed more precisely. The FHWA procedure was used to compare the compiled once-in-3-year concentration to the EPA acute criteria, to the recorded ambient (background) concentration, and to the Washington State Water Quality Standards for Class A waters.

The EPA's 3-year acute criteria were available only for toxic metals (zinc and copper). The stream ambient (background) concentrations in receiving streams were based on average pollutant concentrations from stormwater samples collected from December 1994 through July 1997 in Des Moines Creek, Massey Creek, and Barnes Creek (Herrera and Hall 1997). For each major receiving basin (Des Moines Creek Basin, Miller Creek Basin, Green River Basin, and Lower Puget Sound Basin) potentially affected by the build alternatives, probabilities of exceeding once-in-3-year target concentrations were computed. The same procedure was also used to document any cases where the Washington State Class A standards for toxic metals (zinc and copper) were exceeded.

Details on the FHWA procedure are documented in the water quality discipline report (CH2M HILL August 2000), and in the *SR 509/South Access Road EIS Discipline Report: South Airport Link* (CH2M HILL August 2001a). Treatment efficiencies of selected water quality treatment facilities were computed following median removal rates suggested in the

WSDOT Instructional Letter No. IL 4020.00, Enclosure C (WSDOT 1999) and in FHWA (1996) (Table 3.5-1).

Table 3.5-1
WSDOT Best Management Practices Effectiveness Rates

	Treatment Efficiency (%)			
BMP*	**TSS**	**TKN**	**TP**	**Zinc**
Wet Vault	23	5	5	5
Biofiltration Swale	72	25	28	67
Wet Pond	72	36	53	56
Vegetated Filter Strip	80	34	53	75

**WSDOT (1999).*

Wet ponds, bioswales, wet vaults, and some other innovative technologies, including treatment trains, have been considered for stormwater treatment. A description of technologies and some experimental BMPs being considered were presented in the *Stormwater Treatment Technical Memorandum* (CH2M HILL August 2001b).

Highway loadings were computed using the FHWA procedure (FHWA 1996).

3.5.2 Affected Environment

Basins and Resources

The proposed project would potentially affect the quality of water resources in five basins. These water resources include rivers, creeks, lakes, and groundwater.

Miller Creek Basin

Miller Creek Basin includes a drainage area of 5,200 acres and drains into Puget Sound. The Washington State Department of Fish and Wildlife (WDFW) identifies Miller Creek as stream 09.0371. The basin would be affected to an equal extent by each of the build alternatives; however, only a relatively small area of the basin would be disturbed, and there would likely be no substantial water quality impacts.

Des Moines Creek Basin

Des Moines Creek Basin includes a drainage area of 3,700 acres. Sea-Tac Airport in the northern portion of the basin occupies approximately 27 percent of the total basin area. The remainder of the basin is largely urbanized. Important resources in the basin include Des Moines Creek (King

County 1987) and associated wetlands. Bow Lake, Northwest Ponds (Wetland F), and Tyee Pond currently provide stormwater detention and treatment and are also near the build alternatives. Additional wetlands also are located within the Des Moines Creek Basin. Des Moines Creek, a King County Class 2 stream with salmonids, is the main drainage course in that basin.

Des Moines Creek generally flows south to southwest and empties into Puget Sound near South 222nd Street. WDFW identifies Des Moines Creek as stream 09.0377. Two major tributaries and two minor tributaries flow into Des Moines Creek. The major tributaries are known informally as the East Fork and West Fork. The East Fork, originating from Bow Lake, is a King County Class 3 stream in its lower reaches and unclassified in its upper reaches. Class 3 streams have intermittent flow and are not used by salmonids. The West Fork flows out of the Northwest Ponds complex at the western edge of the Tyee Valley Golf Course. The upper reaches of the West Fork are either designated Class 3 or are unclassified, while the lower reaches are Class 2. The two minor tributaries to Des Moines Creek are both unclassified.

Just upstream of the project area, near the Bow Lake outlet to the East Fork of Des Moines Creek, the corresponding flood frequency exceedance levels are 21, 29, and 35 cubic feet per second (cfs) (Des Moines Creek Basin Committee 1997). In general, impervious surfaces associated with development in the watershed have increased peak flows, resulting in downstream flooding in Des Moines Creek relative to predeveloped conditions. The higher peak flows, in turn, have led to problems with channel erosion and scouring of spawning gravel in downstream reaches of Des Moines Creek. The frequent flooding in the creek has also damaged public buildings and facilities in Des Moines Beach Park (Des Moines Creek Basin Committee 1997).

Lower Green River Basin

The Lower Green River Basin is a large basin that drains to the Duwamish River. Streams designated as 43 and 45 by USFW drain the basin north to Green River, which drains north to Puget Sound.

Stream 43 flows into the Green River at about river mile (RM) 20.0, and is located about 3,000 feet east of the project area. Stream 45 flows into the Green River at about RM 21.7, and is located more than 1 mile east of the project area. Star Lake is located about 1,000 feet east of the project area, and Lake Fenwick is located more than 1 mile east of the project area.

Lower Puget Sound Basin

Streams in the Lower Puget Sound Basin include McSorely Creek, Woodmont Creek, Redondo Creek, and Cold Creek, all draining to Puget

Sound. This basin would be impacted by stormwater runoff from the improvements along the I-5 corridor, located on the eastern boundary of the basin.

McSorley Creek is located within Saltwater State Park and flows into Puget Sound. Woodmont Creek flows directly into Puget Sound. The creek originates in a forested ravine more than 1 mile west of the project area. Woodmont Creek functions primarily as a stormwater conveyance channel with severe bank erosion (King County 1991). Redondo Creek flows directly into Puget Sound. Redondo Creek is located more than 1 mile west of the project area. Redondo Creek is one of the most severely incised channels in the basin, with heavy erosion associated with high flows and poor water quality resulting from nonpoint pollution from residential and commercial sources (King County 1991).

Cold Creek, located more than 1 mile west of the project area, flows into Puget Sound. Cold Creek has been piped and channeled in several locations. According to the *Lower Puget Sound Basin Plan* (King County 1991), Cold Creek drains from Easter Lake.

Mill Creek Basin

Water resources in the Mill Creek Basin include Mill Creek and Lake Dolloff. This basin would be impacted by stormwater runoff from the improvements along 4,000 feet of the I-5 corridor, located on the eastern boundary of the basin.

Mill Creek flows into the Green River at about RM 24.0. Lake Dolloff is located about 1,000 feet west of the project area. Mill Creek flows to the south from the outlet at the southeast end of Lake Dolloff, about 2,000 feet from the project area. Mill Creek drains first south, then north for about 8.4 miles into the Green River.

Groundwater

The project area has three aquifers, including a shallow aquifer, an intermediate aquifer, and a deep aquifer. The aquifers have been used historically as a source of groundwater for water supply. The shallow aquifer has been used for domestic, irrigation, and/or commercial purposes. The intermediate aquifer and the deep aquifer have been primarily used for municipal water supply. The largest municipal user is the Highline Well Field, which draws approximately 1.5 million gallons per day of water from the deep aquifer via the Angle Lake and Des Moines production wells. A new well, referred to as Tyee well, is currently being developed for municipal use. Two additional wells are located on Port of Seattle property: Well 2M, which is used for groundwater monitoring, and Well 1, which is not currently used for drinking water supply.

Surface Water

Des Moines Creek

Des Moines Creek is classified as a Class A (Port of Seattle April 1999) freshwater creek. Class A waters are usable for water supply, livestock watering, fish and wildlife, and recreation. Water quality standards for Class A waters are discussed relative to WAC Chapter 173-201A, *Water Quality Standards for Surface Waters of the State of Washington* (Table 3.5-2).

Water quality data collected in recent years indicate that elevated pollutant levels frequently occur in Des Moines Creek. In response to concerns over increased urbanization within the Des Moines Creek Basin, a multiagency watershed management team represented by Metro, King County, Port of Seattle, Ecology, and Trout Unlimited was established in 1986 to formulate a restoration plan for the creek. The team prepared a watershed management plan to control and maintain water quality and restore and maintain viable populations of salmon and trout. The recommended restoration plan is outlined in the *Des Moines Creek Restoration Project* (Herrera and Hall 1989). In the restoration plan, violations of water quality standards were reported for fecal coliform bacteria, metals, and turbidity.

In addition to water quality concerns associated with urban development, pollutants from operations at Sea-Tac Airport also are a concern (Des Moines Creek Basin Committee 1997). In general, water quality monitoring at the airport has shown runoff from the airport to be comparable to that of runoff from other urban land uses in the basin. However, there are industrial pollutants unique to airport operations that are collected and treated by the airport’s Industrial Wastewater System (IWS). The IWS collects and processes drainage from areas in the airport that are more likely to contribute pollutants such as the aircraft servicing, loading, and de-icing locations. Effluent from the IWS is treated and then routed by pipeline along Des Moines Creek to just below the Midway Sewage Treatment Plant, where the IWS line joins the deep sewer outfall, which discharges to Puget Sound. Three fuel spills from the airport into Des Moines Creek between 1973 and 1986 resulted in mortality to fish and aquatic life (Parametrix 1994). Since these accidental spills, modifications to the IWS and inclusion of the Tyee Pond within the Regional Detention Facility make it unlikely that an impact of this nature would ever be repeated. Tyee Pond was designed to contain hydrocarbon spills and prevent them from reaching Des Moines Creek.

The airport's Storm Drain System (SDS) generally drains the runways, taxiways, and building roofs. Because these areas contribute relatively small pollutant loads, stormwater from the SDS discharges directly to Des Moines Creek in several locations along the perimeter of the airport. Monitoring conducted by the Port of Seattle indicates that stormwater from the airport is

Table 3.5-2
Washington State Department of Ecology Water Quality Standards for Class A Freshwaters and Lake Class

Parameter	Water Type	Standard*
Fecal coliform bacteria	Freshwater/ Lake	Shall not exceed a geometric mean of 100 colonies per 100 mL, and no more than 10% of samples used in calculating the geometric mean shall exceed 200 colonies per 100 mL.
Dissolved oxygen	Freshwater	Shall exceed 8.0 mg/L.
	Lake	No measurable decrease from natural conditions.
Total dissolved gas	Freshwater/ Lake	Shall not exceed 110% of saturation at any point of sample collection.
Temperature	Freshwater	Shall not exceed 18°C due to human activities. Incremental increases resulting from nonpoint source activities shall not exceed 2.8°C.
pH	Freshwater	Shall be in the range 6.5 to 8.5, with the human-caused variation within a range of less than 0.5 units.
	Lake	No measurable change from natural conditions.
Turbidity	Freshwater	Shall not exceed 5 NTU over background conditions when the background is 50 NTU or less, or have more than 10% increase in turbidity when background is more than 50 NTU.
	Lake	Shall not exceed 5 NTU over background conditions.
Toxic, radioactive, or deleterious material concentrations	Freshwater	Shall be below concentrations that may adversely affect characteristic water uses, cause acute or chronic conditions in the most sensitive aquatic biota, or adversely affect public health.

** Adapted from Water Quality Standards for Surface Waters of the State of Washington, WAC Chapter 173-201A, November 18, 1997. See this statute for complete language on water quality standards for these parameters and acute and chronic standard for toxic substances (e.g., metals, pesticides, and organics), which are not listed here.*
mL = milliliter
mg/L = milligrams per liter
°C = degree(s) Celsius
% = percent
NTU = nephelometric turbidity units

generally cleaner compared to similar urban runoff for TSS, biological oxygen demand (BOD), TP, total copper, total lead, total zinc, and oil and grease (Port of Seattle November 1996, June 1997, September 1997, November 1998). Chemicals associated with de-icing activities have also been detected in stormwater samples from the airport (Des Moines Creek Basin Committee 1997). For example, ammonia (from urea) in airport stormwater has been detected at concentrations that violate both chronic and acute toxicity standards for aquatic life (Port of Seattle April 1996). However, because urea is no longer used as a de-icer at the airport, observed ammonia levels have been generally lower compared to other urban land uses (Port of Seattle 1999). Both the airport's IWS and SDS facilities are covered by an NPDES permit issued by Ecology. This permit regulates the discharges from both systems and is periodically reviewed and updated.

In 1997, the *Des Moines Creek Basin Plan* (Des Moines Creek Basin Committee 1997) was produced through a cooperative interjurisdictional effort undertaken by King County, the Cities of SeaTac and Des Moines, and the Port of Seattle. One of the primary goals of this basin plan was to develop a shared plan for addressing water quality and quantity issues. The specific water quality-related concerns that were identified in the *Des Moines Creek Basin Plan* are: Turbidity and suspended solids; high nutrient levels; water temperatures that frequently exceed optimal upper temperature limits for salmonid species; and low dissolved oxygen.

Average seasonal flow rates near the outlet of Des Moines Creek range from 1.3 cfs in July to 12.3 cfs in December. At the outlet of Des Moines Creek, flow exceedance levels for events with 2-, 5-, and 10-year recurrence intervals are estimated to be 171, 211, and 255 cfs, respectively. In general, impervious surfaces associated with development in the watershed have increased peak flows and downstream flooding in Des Moines Creek relative to predeveloped conditions. The higher peak flows have, in turn, led to problems with channel erosion and scouring of spawning gravel in downstream reaches of Des Moines Creek. The frequent flooding in the creek has also damaged public buildings and facilities in Des Moines Beach Park.

Lower Green River

The Lower Green River has been listed as a Class AA (extraordinary) freshwater creek (WAC 173-201A 1997). Class AA waters generally exceed the water quality requirements for all beneficial uses. The Lower Green River watershed is part of the Green River/Duwamish River watershed, and is located east of I-5 and the Sea-Tac Airport, including Angle Lake. United States Geological Survey (USGS), Ecology, and Metro have measured water quality at several locations on this watershed during the last decade. The focus of these studies was nutrients from precipitation and domestically applied fertilizers. Precipitation is estimated to contribute from 1 to 2 tons of nitrogen per square mile each year, and from 0.10 to 0.2 ton of phosphorus per square mile of the watershed each year (USGS 1995). Additionally, these studies estimated annual contribution of 1 ton per square mile per year of inorganic nitrogen. No additional water quality data have been collected for this project.

Streams of Lower Puget Sound Basin

No water quality data are available for McSorley Creek and Woodmont Creek. Redondo Creek and Cold Creek have been monitored by King County (1991). However, water quality standards in those creeks have not been exceeded since 1998 (Ecology 1998).

Mill Creek

King County and Ecology conducted water quality monitoring on the creek during 1993 and 1994. Water temperatures exceeded the Washington State standards upper temperature limits several times. Fecal coliform bacteria similarly exceeded the Washington State standards upper limits numerous times.

Clean Water Act Section 303(d) Waters

According to Ecology's Section 303(d) list (1998), Des Moines Creek, Mill Creek, and some reaches of the Green River do not meet Washington State water quality standards for selected parameters.

Des Moines Creek is listed as a 303(d) water because of high fecal coliform bacteria concentrations. Temperature and dissolved oxygen in the creek were also measured above the standards during one monitoring event. Green River is listed as a 303(d) water because of exceedances for mercury, fecal coliforms, chromium, and temperature. Mill Creek is listed as a 303(d) water because of exceedances for temperature, dissolved oxygen, and fecal coliforms.

3.5.3 Environmental Impacts

Alternative A (No Action)

Under the No Action Alternative, adverse effects on water quality from the proposed project would not occur. However, other roadway construction and developments are planned and anticipated to occur over the next few years in the project vicinity. These activities would add impervious surfaces to the basins in the project area that could adversely affect the water quality of streams and wetlands.

Impacts Common to All Build Alternatives

Surface Water

Construction activities for each of the build alternatives would include clearing vegetation, regrading the existing ground surface, installing bridges at stream crossings, excavation for structures, staging and handling construction materials, and operating machinery. Removing vegetation would decrease stormwater infiltration into the soil profile, expose mineral soils, and decrease evapotranspiration. Regrading the ground surface along the alternative alignments would disrupt upstream surface waters, including sheet flow and channelized flow. Sheet flow that currently flows across the project area from land upstream and adjacent to the roadway would be intercepted, conveyed, and discharged to a collection system.

Removing vegetation, intercepting sheet flow, and compacting soils would increase surface runoff volumes and rates. The increase in surface water flow rates and volumes could cause erosion and subsequent sedimentation in receiving channels. Increased surface water flow in the disturbed area would also have the potential to transport sediments downstream. Removing vegetation adjacent to streams could reduce shading and increase the temperature of water in the streams.

Highway operations would have the potential to affect surface water quantity and quality. The relative impact of a particular activity would depend to a large extent on its proximity to the receiving water bodies and the susceptibility of the water to the delivered pollutant. Specifically, Alternatives B, C2, and C3 would affect Des Moines Creek at one crossing of the main stem of Des Moines Creek, and four crossings of the East Fork of Des Moines Creek. No streams would be crossed by the I-5 improvements.

Stormwater runoff from the highway, accidental spills, sanding and de-icing, and vegetation controls are operational activities that have the potential to affect surface water. The maintenance of road and drainage structures would potentially impact surface water. The operational impacts are described below.

Water Quantity

The impervious highway surface and reduced soil infiltration capacity resulting from grading and landscaping in the remaining portion of the right-of-way would increase surface water runoff rates and volumes. Stormwater from the highway would be collected and conveyed to a management facility to attenuate peak flow rates. Nevertheless, total runoff volumes would most likely be higher compared with existing conditions, and the duration of flow for a given storm volume would be shorter.

Regrading along the proposed alternative alignments would change the course of offsite sheet flow. An interceptor ditch along the highway would collect offsite unconcentrated flow crossing the alignments and convey the water to a discharge outlet. Concentrating flows in this manner would have the potential to increase erosion in the receiving channel. Altering the existing path of unconcentrated flow also might decrease the water supply to dependent resources and groundwater.

Water Quality

Operation and maintenance of the build alternatives could degrade the quality of surface waters unless stormwater is effectively treated. Pollutants such as oil and grease, zinc, copper, wear from tires, vehicle particle flake, sediments, herbicides, and nutrients are commonly associated with highway stormwater runoff.

SR-509 Freeway Extension/South Access Road

Using the FHWA design procedure (FHWA April 1990a, April 1990b), the probabilities of exceeding ambient background concentrations and Washington State Class A standards are presented in Tables 3.5-3 and 3.5-4 for the proposed SR 509 freeway extension and South Access Road. These tables present concentrations without treatment by BMPs. Stormwater pollutant concentrations for all pollutants would exceed the 0.35% threshold, below which no stormwater treatment is required. Statistically, there would be no difference among the build alternatives, although Alternative C2 would have the lowest concentrations in the Miller Creek Basin and Alternative C3 the lowest concentrations in the Des Moines Creek Basin. The slight differences in concentrations would be due to different tributary watershed sizes and percentage of impervious surfaces on each watershed.

Using the WSDOT BMPs effectiveness rates (Table 3.5-1), the final pollutant concentrations after treatment at various BMPs are presented in Table 3.5-5. The last column of the table summarizes the concentration after treatment with biofiltration swales and wet ponds, the treatment train considered in the drainage design (CH2M HILL August 2001b). The thresholds recommended by the EPA, and Washington State Class A threshold for zinc are also included for comparison. To satisfy these thresholds, treatment using wet ponds with biofiltration swales, vegetated filter strips, or both would be necessary, as those facilities are the most efficient.

The average annual pollutant loadings from new roadway surfaces were computed for TSS, zinc, TKN, and TP using the FHWA procedure (FHWA 1996). The obtained annual loadings were then reduced assuming treatment efficiencies for biofiltration swales and wet ponds (Table 3.5-1) and compared with the annual pollutant loadings from the existing condition in Table 3.5-6. In general, the annual loadings after treatment would be higher than the annual loadings for existing conditions. The total loadings from Alternative C2 would be lower than the loadings from Alternatives B and C3 for all pollutants in both Des Moines Creek Basin and Miller Creek Basin. Average annual loading in both basins before treatment at stormwater facilities are also included for comparison in Table 3.5-6. TSS loading would be reduced over 10 times, zinc loading 7 times, TP 3 times, and TKN only 2 times.

Table 3.5-3
Stormwater Pollutant Concentrations from New Roadway Surfaces Relative to Background Concentrations

Basin/Parameter	Site Median Concentration (mg/L)[a]	Stream Background Concentration (mg/L)[b]	FHWA Model: Percent of Events Exceeding Once-in-3-Year Background Concentrations		
			Alternative B	Alternative C2 (Preliminary Preferred)	Alternative C3
Miller Creek Basin -SR-509 impact					
Total Suspended Solids	142.0	60.0	87	79	82
Zinc	0.329	0.023	99	98	99
Copper	0.054	0.005	98	96	97
Total Phosphorus	0.4	0.151	90	95	86
Nitrates and Nitrites	0.76	0.76	45	38	34
Des Moines Creek Basin -SR-509 impact					
Total Suspended Solids	142.0	58.7	17	17	70
Zinc	0.329	0.023	53	53	97
Copper	0.054	0.004	51	51	96
Total Phosphorous	0.4	0.151	20	20	75
Nitrates and Nitrites	0.76	0.652	3	3	29
Des Moines Creek Basin- I5 impact					
Total Suspended Solids	142	58.7	17	17	17
Zinc	0.329	0.023	53	53	53
Copper	0.054	0.004	51	51	51
Total Phosphorous	0.4	0.151	20	20	20
Nitrates and Nitrites	0.76	0.652	3	3	3
Lower Green River Basin - I5 impact					
Total Suspended Solids	142.0	7.9	67	67	67
Zinc	0.329	0.023	22	22	22
Copper	0.054	0.005	20	20	20
Total Phosphorus	0.4	0.031	54	54	54
Nitrates and Nitrites	0.76	0.366	1	1	1
Lower Puget Sound Basin (McSorley Creek) - I5 impact					
Total Suspended Solids	142.0	12.0	59	59	59
Zinc	0.329	0.023	98	98	98
Copper	0.054	0.005	98	98	98
Total Phosphorus	0.4	0.141	84	84	84

Table 3.5-3
Stormwater Pollutant Concentrations from New Roadway Surfaces Relative to Background Concentrations

Basin/Parameter	Site Median Concentration (mg/L)[a]	Stream Background Concentration (mg/L)[b]	FHWA Model: Percent of Events Exceeding Once-in-3-Year Background Concentrations		
			Alternative B	Alternative C2 (Preliminary Preferred)	Alternative C3
Nitrates and Nitrites	0.76	0.43	39	39	39
Mill Creek Basin - I5 impact					
Total Suspended Solids	142.0	12.0	87	87	87
Zinc	0.329	0.023	42	42	42
Copper	0.054	0.005	39	39	39
Total Phosphorus	0.4	0.141	15	15	15
Nitrates and Nitrites	0.76	0.43	6	6	6

Note: No treatment was considered in this table. All exceedance probabilities higher than 0.35% necessitate stormwater treatment.

[a] Site median concentration values are the median site values from FHWA database (993 runoff events) for urban highways with average annual daily traffic (AADT) > 30,000 vehicles/day.

[b] Background concentrations in Des Moines and Miller basins are based on the average of 15 stormwater samples in Des Moines Creek, four locations in Massey Creek Basin (Herrera, 1997). Background concentrations of zinc and copper in all basins were estimated from these measurements. Stream background concentrations for Miller Creek (for all pollutants except for zinc and copper) were estimated as arithmetic averages from samples in Des Moines Creek and Massey Creek Basins. Stream concentrations for the Lower Green River Basin were estimated from the water quality samples collected by Department of Ecology at Station 09A090 on Green River at Kent. Stream concentrations for the Mill Creek Basin were estimated from the water quality samples collected by Department of Ecology at Station 09E070 on Mill Creek at Orillia.

Table 3.5-4
Stormwater Pollutant Concentrations from New Roadway Surfaces Compared to Washington State Class A Standards

Basin/Parameter	Site Median Concentration (mg/L)a	WA Class A Standard (mg/L)b	FHWA Model: Percent of Events Exceeding State Standards Once Every 3 Years		
			Alternative B	Alternative C2 (Preliminary Preferred)	Alternative C3
Miller Creek Basin - SR-509 impact					
Zinc	0.329	0.064	84	72	76
Copper	0.054	0.00885	89	79	82
Des Moines Creek Basin - SR-509 impact					
Zinc	0.329	0.064	70	70	61
Copper	0.054	0.00885	78	78	70
Des Moines Creek Basin - I-5 impact					
Zinc	0.329	0.064	13	13	13
Copper	0.054	0.00885	17	17	17
Lower Green River Basin- I5 impact					
Zinc	0.329	0.064	3	3	3
Copper	0.054	0.00885	5	5	5
Lower Puget Sound Basin (McSorley Creek) - I5 impact					
Zinc	0.329	0.064	73	73	73
Copper	0.054	0.00885	80	80	80
Mill Creek Basin - I5 impact					
Zinc	0.329	0.064	8	8	8
Copper	0.054	0.00885	12	12	12

Note: No treatment was considered in this table. All exceedance probabilities higher than 0.35% require stormwater treatment. Hardness of 50 ppm (1996) was measured for stormwater samples; hardness of 80 ppm was measured for baseflow samples.

[a] *Site median concentration values are the median site values from the FHWA database (993 runoff events) for urban highways with average annual daily traffic > 30,000 vehicles/day.*

[b] *These thresholds were computed using hardness of 50 ppm.*

Table 3.5-5
Pollutant Removal Using Various BMPs for Selected Parameters

Basin/Parameter	Site Median Concentration (mg/L)[b]	Background Concentration (mg/L)[c]	EPA Acute Criteria (mg/L)[d]	WA State Standard (stormflow; baseflow) (mg/L)[e]	Concentration After BMP Treatment (mg/L)[a]				Biofiltration Swale and Wet Pond train
					Wet Vault	Biofiltration Swale	Wet Pond	Vegetated Filter Strip	
Des Moines Creek Basin									
Total Suspended Solids	142.00	58.70			109.34	39.76	39.76	28.40	11.13
Zinc	0.33	0.02	0.18	0.064; 0.095	0.31	0.11	0.14	0.08	0.05
Total Phosphorus	0.40	0.15			0.38	0.29	0.19	0.19	0.14
Total Kjeldahl Nitrogen	1.83	---			1.74	1.37	1.17	1.21	0.88
Miller Creek Basin									
Total Suspended Solids	142.00	60.00			109.34	39.76	39.76	28.40	11.13
Zinc	0.33	0.02	0.18	0.064; 0.095	0.31	0.11	0.14	0.08	0.05
Total Phosphorus	0.40	0.15			0.38	0.29	0.19	0.19	0.14
Total Kjeldahl Nitrogen	1.83	---			1.74	1.37	1.17	1.21	0.88
Lower Green River Basin									
Total Suspended Solids	142.00	7.9			109.34	39.76	39.76	28.40	11.13
Zinc	0.33	0.023	0.18	0.064; 0.095	0.31	0.11	0.14	0.08	0.05
Total Phosphorus	0.40	0.031			0.38	0.29	0.19	0.19	0.14
Total Kjeldahl Nitrogen	1.83	---			1.74	1.37	1.17	1.21	0.88
Lower Puget Sound Basin									
Total Suspended Solids	142.00	12.0			109.34	39.76	39.76	28.40	11.13
Zinc	0.33	0.023	0.18	0.064; 0.095	0.31	0.11	0.14	0.08	0.05
Total Phosphorus	0.40	0.141			0.38	0.29	0.19	0.19	0.14
Total Kjeldahl Nitrogen	1.83	---			1.74	1.37	1.17	1.21	0.88
Mill Creek Basin									
Total Suspended Solids	142.00	12.0			109.34	39.76	39.76	28.40	11.13
Zinc	0.33	0.023	0.18	0.064; 0.095	0.31	0.11	0.14	0.08	0.05
Total Phosphorus	0.40	0.141			0.38	0.29	0.19	0.19	0.14
Total Kjeldahl Nitrogen	1.83	---			1.74	1.37	1.17	1.21	0.88

Note: Hardness of 50 ppm was measured for stormwater samples: hardness of 80 ppm was measured for baseflow samples.

[a] *See Table 3.5-1 for BMP treatment efficiencies.*

[b] *FHWA (1996). Site median concentration values are the median site values from the FHWA database (993 runoff events) for urban highways with average annual daily traffic >30,000 vehicles/day.*

[c] *Stream background concentrations for the Miller Creek and Green River Basins (for all pollutants except zinc and copper) were estimated as arithmetic averages from samples in Des Moines Creek and Massey Creek Basins. Stream concentrations for the Lower Puget Sound and Mill Creek Basins were estimated as arithmentic averages form samples in Mill Creek Basin. Stream concentrations for the Lower Green River Basin were estimated from the water quality samples from Green River in Kent at 212th Street.*

[d] *National Urban Runoff Program (NURP) conducted by EPA.*

[e] *Source: WAC Chapter 173-201A (stormflow hardness = 50 ppm, baseflow hardness = 80 ppm).*

Table 3.5-6
Total Pollutant Loading From New Roadway Surfaces from SR 509/South Access Road Alternatives [kg/year]

Pollutant	Alternative	Annual Mass Loading Before Treatment		Annual Mass Loading After Treatment at Bioswale and Wet Pond	
		Des Moines Creek	Miller Creek	Des Moines Creek	Miller Creek
Total Suspended Solids	Alternative B	55,937	4,295	4,385	337
	Alternative C2	41,518	1,267	3,255	99
	Alternative C3	43,808	1,297	3,435	102
Zinc	Alternative B	130	9.5	19	1.4
	Alternative C2	96	2.8	14	0.4
	Alternative C3	101	2.9	15	0.4
Total Kjeldahl Nitrogen	Alternative B	721	52.6	346	25.2
	Alternative C2	535	15.5	257	7.4
	Alternative C3	565	16.9	271	8.1
Total Phosphorus	Alternative B	130	9.5	44	3.2
	Alternative C2	96	2.8	32	0.9
	Alternative C3	101	2.9	34	1.0

Note: Annual mass loadings for each alternative were computed using the FHWA procedure (FHWA, 1996). Pollutant loadings were then reduced assuming treatment efficiencies from Table 3.5-1.

I-5 Improvements

The proposed I-5 improvements would create approximately 37 acres of new impervious surface. Approximately 1.3 acres would be located in the Miller Creek Basin, 10.3 acres in the McSorley Creek sub-basin of the Lower Puget Sound Basin, 23.3 acre in the Lower Green River Basin, and 2.1 acres in the Des Moines Creek Basin. Runoff from the new impervious surfaces has the potential to adversely affect water quality; however, no streams would be crossed by the proposed I-5 improvements.

Drainage design and layout of stormwater treatment facilities is detailed in the *I-5 Corridor Improvements Drainage Facilities Concepts Technical Memorandum* (CH2M HILL November 2001). Stormwater generated from all new surfaces would affect Des Moines Creek Basin, Lower Green River Basin, Lower Puget Sound Basin (mostly McSorley Creek), and Mill Creek Basin. Stormwater would be treated by biofiltration swale, wet pond, or biofiltration swale-wet pond treatment train.

Assessment of stormwater pollutant concentrations from new roadway surfaces is presented in Table 3.5-3 relative to background concentrations, and in Table 3.5-4 relative to Washington State Class A-standards. Without treatment, the greatest potential impact would be in the Lower Puget Sound Basin, where almost 100 percent of rainfall events would generate pollutants that would exceed the threshold criteria for zinc and copper. TSS loadings would be exceeded most of the times in the Mill Creek Basin (87 percent). In general, pollutant concentrations from I-5 improvements in Des Moines Creek Basin would be several times less than the impact from the SR 509 improvements in the same basin.

The average annual loading from new roadway surfaces were computed for TSS, zinc, TKN, and TP using the FHWA procedure (FHWA 1996). The obtained loadings were reduced for stormwater facilities specified in the drainage design report (CH2M HILL November 2001), using treatment efficiencies from Table 3.5-1. These loadings were then compared with the pollutant loadings before the treatment (Table 3.5-7). The highest removal efficiency would be achieved in the Des Moines Creek and Mill Creek basins for all pollutants. The removal of TSS pollutants would be the most efficient (56 to 72 percent). The removal of TKN pollutants would be the least efficient (24 to 36 percent), especially in the Lower Green River Basin (24 percent).

South Airport Link

This 1,000-foot segment of the proposed South Access Road would impact only the East Fork of Des Moines Creek. For design options H0, H2-A, and H2-B, bioswales in combination with wet vaults are proposed for stormwater treatment. Stormwater pollutant concentrations, expressed as exceedance

Table 3.5-7
Total Pollutant Loading from New Roadway Surfaces for I-5 improvements

Pollutant	Basin impacted by I-5	Annual Mass Loading Before Treatment [kg/year]	Annual Mass Loading After Treatment [kg/year]	Overal efficiency [percent]
TSS	Des Moines	4,342	1,216	72
	Lower Green River	54,632	24,010	56
	Lower Puget Sound	25,585	9,320	64
	Mill Creek	4,284	1,199	72
Zinc	Des Moines	10	4	56
	Lower Green River	127	74	42
	Lower Puget Sound	59	30	50
	Mill Creek	10	4	59
TKN	Des Moines	56	36	36
	Lower Green River	704	538	24
	Lower Puget Sound	330	237	28
	Mill Creek	55	37	33
TP	Des Moines	12	6	53
	Lower Green River	154	105	32
	Lower Puget Sound	72	44	39
	Mill Creek	12	7	46

Note: Annual mass loadings for each alternative were computed using the FHWA procedure (FHWA, 1996). Pollutant loadings were then reduced assuming efficiency of treatment facilities from Table 3.5-1. No treatment was applied for the pollutant loading for the existing conditions.

probabilities, would be highest at vault 1 for design option H0, and at vault 2 for design options H2-A and H2-B. Stormwater pollutant concentrations would be higher for design options H2-A and H2-B than for design option H0 for all constituents (Tables 3.5-8 and 3.5-9). These tables present concentrations without treatment by BMPs.

Design option H0 would have the lowest number of runoff flows exceeding the once-in-3-year threshold of 0.3 percent to 0.4 percent. Design option H2-B would have the highest number of runoff events exceeding the once-in-3-year threshold of 0.3 percent to 0.4 percent.

Without treatment, the background concentration of all pollutants would be exceeded numerous times for flows draining to vaults 1, 2, and 3 (Table 3.5-8), and Washington State water quality standards for the same pollutants would also be exceeded (Table 3.5-9). Pollutant concentrations after treatment at several BMPs, including biofiltration swales and wet vaults (as recommended in the stormwater plan), were included for comparison (Table 3.5-10). The results show that use of vegetated filter strip could improve treatment efficiencies. The results for annual pollutant loading for the three South Link design options after treatment at bioswales followed by wet vaults are presented in Table 3.5-11. TSS and zinc loading would be reduced 3 to 4 times after treatment, while TP and TKN would be reduced only 1 to 2 times.

Groundwater

Infiltrated stormwater pollutants from new impervious surfaces could cause potential adverse impacts on groundwater quality. However, this potential would be low if standard BMPs are implemented. The Angle Lake Well and other wells in the study area are within the South King County Groundwater Management Area (GWMA). Although there is no aquifer protection plan for the Angle Lake Well, the protection plan of the wellhead area is in a 5-year development phase and is not yet finalized (Johnson pers. comm. 2000). Whenever the BMPs become available, they will be incorporated into the protection plan.

Accidental Spills

The volume of hazardous materials (such as petroleum products) that would be transported through and delivered within the project area is determined predominantly by the local demand for such materials. Each of the build alternatives would provide a transportation corridor designed under current regulatory safety standards, which would result in a lower frequency of accidents compared with existing roads designed to earlier standards. Thus, the risk of accident-related spills would be expected to be lower under any of the build alternatives compared to the No Action Alternative because the new roadway would improve the overall safety of the road system.

Table 3.5-8
Stormwater Pollutant Concentrations
for South Airport Link Options Relative to Background Concentrations

Option/Parameter	Site Median Concentration (mg/L)[a]	Stream Background Concentration (mg/L)[b]	Percent of Events Exceeding Once-in-3-Year Stream Background Concentrations		
			Runoff Draining to Vault 1	Runoff Draining to Vault 2	Runoff Draining to Vault 3
Option H0					
Total Suspended Solids	142	58.7	26	14	4
Zinc	0.329	0.023	68	48	19
Copper	0.054	0.004	66	45	17
Total Phosphorus	0.4	0.151	30	16	5
Nitrates and Nitrites	0.76	0.652	11	5	0.3
Option H2-A					
Total Suspended Solids	142	58.7	26	29	4
Zinc	0.329	0.023	68	72	19
Copper	0.054	0.004	65	69	18
Total Phosphorus	0.4	0.151	30	33	5
Nitrates and Nitrites	0.76	0.652	11	12	0.3
Option H2-B					
Total Suspended Solids	142	58.7	28	35	4
Zinc	0.329	0.023	70	78	20
Copper	0.054	0.004	68	76	18
Total Phosphorus	0.4	0.151	32	40	5
Nitrates and Nitrites	0.76	0.652	12	16	1

Note: No treatment was considered in this table. All exceedance probabilities higher than 0.35% require stormwater treatment.
[a] Site median concentration values are the median site values from the FHWA database (993 runoff events) for urban highways with average annual daily traffic >30,000 vehicles/day.
[b] Background concentrations are based on the average of 15 stormwater samples collected from 2 locations in Des Moines Creek and 4 locations in Massey Creek Basin (Herrera and Hall, 1997).

Table 3.5-9
Stormwater Pollutant Concentrations for South Airport Link Options Relative to Washington Class A Standards

Option/Parameter	Site Median Concentration (mg/L)[a]	WA Class A Standard (mg/L)[b]	Percent of Events Exceeding Once-in-Three-Year Stream Background Concentrations		
			Runoff Draining to Vault 1	Runoff Draining to Vault 2	Runoff Draining to Vault 3
Option H0					
Zinc	0.329	0.064	20	10	3
Copper	0.054	0.00885	26	14	4
Option H2-A					
Zinc	0.329	0.064	20	22	3
Copper	0.054	0.00885	26	28	4
Option H2-B					
Zinc	0.329	0.064	21	27	3
Copper	0.054	0.00885	27	35	18

Note: No treatment was considered in this table. All exceedance probabilities higher than 0.35% require stormwater treatment. Hardness of 50 ppm was measured for stormwater samples; hardness of 80 ppm was measured for baseflow samples.

[a] FHWA (1996). Site median concentration values are the median site values from the FHWA database (993 runoff events) for urban highways with average annual daily traffic >30,000 vehicles/day.

[b] WAC Chapter 173-201A. These thresholds were computed using hardness of 50 ppm.

Table 3.5-10
Pollutant Removal Using Various BMPs for Selected Parameters for South Airport Link Design Options

Option/Parameter	Site Median Concentration (mg/L)[b]	Background Concentration (mg/L)[c]	EPA Acute Criteria (mg/L)[d]	WA State Standard (stormflow; baseflow) (mg/L)[e]	Concentration After BMP Treatment (mg/L)[a]			
					Biofiltration Swale	Biofiltration Swale and Wet Vault	Wet Pond	Vegetated Filter Strip
Option H0, H2A, H2B								
Total Suspended Solids	142.000	58.700	--	--	39.76	30.62	39.76	28.40
Zinc	0.329	0.023	0.18	0.064; 0.095	0.11	0.10	0.14	0.08
Total Phosphorus	0.400	0.151	--	--	0.29	0.27	0.19	0.19
Total Kjeldahl Nitrogen	1.830	--	--	--	1.37	1.30	1.17	1.21

Note: Hardness of 50 ppm was measured for stormwater samples; hardness of 80 ppm was measured at baseflow samples.

[a] *See Table 3.5-1 for BMP treatment efficiencies. The analysis is limited only to the parameters defined in Table 3.5-1.*

[b] *FHWA (1996). Site median concentration values are the median site values from the FHWA database (993 runoff events) for urban highways with average annual daily traffic >30,000 vehicles/day.*

[c] *Background concentrations are based on the average of 15 stormwater samples collected from 2 locations in Des Moines Creek and 4 locations in Massey Creek Basin (Herrera & Hall, 1997).*

[d] *FHWA (April 1990a).*

[e] *WAC 173-201A (stormflow hardness = 50 ppm, baseflow hardness = 80 ppm).*

-- = No criteria/rules available.

Table 3.5-11

Total Pollutant Loading From New Roadway Surfaces for South Airport Link Design Options

Pollutant	Option	Annual Mass Loading Existing Conditions	Annual Mass Loading After Wet Vault and Bioswale [kg/year]*
Total Suspended Solids	Option H0	3,626	778
	Option H2-A	4,599	1,007
	Option H2-B	5,002	1,135
Zinc	Option H0	8	3
	Option H2-A	11	3
	Option H2-B	12	4
Total Kjeldahl Nitrogen	Option H0	47	33
	Option H2-A	59	43
	Option H2-B	64	48
Total Phosphorus	Option H0	8	6
	Option H2-A	11	7
	Option H2-B	12	8

Note: Annual mass loadings were computed using the FHWA procedure (FHWA 1996). Pollutant loadings were then reduced assuming treatment efficiency from Table 3.5-1. No treatment was applied for pollutant loading for existing conditions.

The Tyee wetland/stormwater pond was designed to control stormwater flow and allow temporary shut down of flow to Des Moines Creek in the event of a pollutant spill further upstream. Where the pond could not be avoided, each of the build alternatives would span the pond with a bridge. Because no fill or bridge supports would be placed within the pond, there would be no reduction in pond storage volume, and, therefore, no effect on its stormwater control function.

Vegetation Management

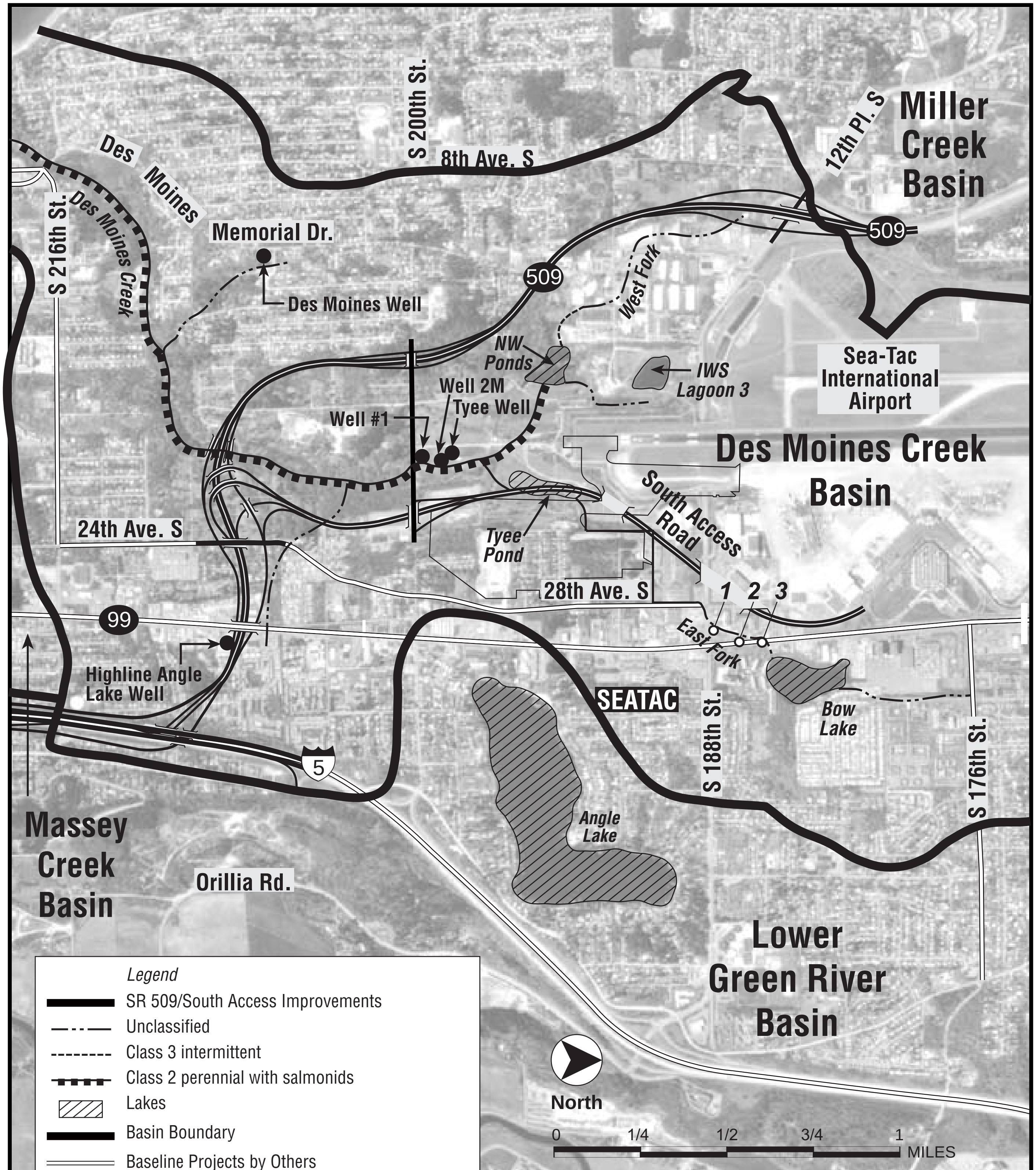
Vegetation would be managed through implementation of Integrated Vegetation Management (IVM) within WSDOT's *Roadside Classification Plan* (RCP) (WSDOT 1996). The IVM promotes use of native vegetation, implementation of the visual quality policy, and reduced use of fertilizers, pesticides, and other chemical controls. The visual quality policy promotes environmentally beneficial landscaping, including use of water-efficient and runoff-reduction practices and construction with minimum impact on habitat. However, even with the most conservative use, some amounts of landscaping chemicals or herbicides would be expected to enter the receiving surface water bodies during storm events.

Alternative B

Under Alternative B, the SR 509 freeway extension and South Access Road (Figure 3.5-2) would create 89.5 acres of new impervious surface in Des Moines Creek and Miller Creek Basins. Total new impervious surface area for Alternative B, including the I-5 improvements, would be 126.5 acres. The SR 509 alignment of Alternative B would necessitate one stream channel crossing over a Class 2 reach of Des Moines Creek near the intersection of South 208th Street and 18th Avenue South. The alignment of the South Access Road would cross the channelized and piped upper reaches of the East Fork tributary to Des Moines Creek at four locations, which are either Class 3 or unclassified.

Runoff from Alternative B would have the greatest number of storm events exceeding the once-in-3-year threshold of 0.35 percent (Table 3.5-3). Without treatment, the potential to exceed Washington State standards for zinc and copper in Des Moines Creek Basin and Miller Creek Basin would be the highest of the build alternatives (Table 3.5-4). With the proposed stormwater treatment, loadings of each pollutant evaluated would be the highest of the build alternatives (Table 3.5-6). Annual TSS loading would range from nearly 4,300 kg (Miller Creek Basin) to 337 kg (Des Moines Creek Basin).

Potential impacts associated with the proposed South Airport Link design options and I-5 improvements are described under Impacts Common to All Build Alternatives.



Legend

- SR 509/South Access Improvements
- Unclassified
- Class 3 intermittent
- Class 2 perennial with salmonids
- Lakes
- Basin Boundary
- Baseline Projects by Others
- Well Locations
- SASA Limits
- ***1,2,3*** Recommended Locations of Vaults 1, 2, 3 for South Airport Link. Note: On this scale, locations are approximately identical for all alternatives.

FIGURE 3.5-2

Water Resources and Basin Boundaries – Alternative B

SR 509: Corridor Completion/I-5/South Access Road Environmental Impact Statement

Alternative C2 (Preliminary Preferred)

Under Alternative C2 (Figure 3.5-3), the proposed SR 509 freeway extension and South Access Road would create 76 acres of new impervious surface in Des Moines Creek and Miller Creek Basins. Total new impervious surface area for Alternative C2, including the I-5 improvements, would be 113 acres. Water quality impacts from construction and operation would be the highest in areas where the roadway alignment would cross Des Moines Creek and at four crossings of the East Fork of Des Moines Creek.

Runoff from Alternative C2 would yield exceedance probabilities that are similar to Alternatives B in Des Moines Creek Basin, but lower than Alternative B in Miller Creek Basin (Table 3.5-3). Without treatment, the potential to exceed Washington State standards for zinc and copper in Des Moines Creek Basin would be the same as Alternative B (Table 3.5-4). However, they would not exceed the once-in-3-year standard in Miller Creek Basin.

With the proposed stormwater treatment, pollutant loadings would be lowest of the build alternatives for each pollutant evaluated. Annual TSS loading would range from 3,255 kg (Des Moines Creek Basin) to 99 kg (Miller Creek Basin), which would be 36 percent lower than Alternative B and 6 percent lower than Alternative C3 (Table 3.5-6).

Potential impacts associated with the proposed South Airport Link design options and I-5 improvements are described under Impacts Common to All Build Alternatives.

Alternative C3

Under Alternative C3 (Figure 3.5-4), the proposed SR 509 freeway extension and South Access Road would create 76.5 acres of new impervious surface in Des Moines Creek and Miller Creek Basins. Total new impervious surface area for Alternative C3, including I-5 improvements, would be 113.5 acres. Potential water quality impacts from construction and operation would be the highest in areas where the roadway alignment would cross Des Moines Creek and the East Fork of Des Moines Creek. The number and locations of stream crossings would be the same as Alternative C2.

Exceedance probabilities of background concentrations in Miller and Des Moines Creek would be approximately the same as Alternative C2, but lower than Alternative B (Tables 3.5-3 and 3.5-4). With the proposed stormwater treatment, pollutant loadings would be similar to Alternative C2 and lower than Alternative B for each pollutant evaluated (Table 3.5-6). Annual TSS loadings would range from 3,435 kg (Des Moines Creek Basin) to 102 kg (Miller Creek Basin), which would be 6 percent higher than Alternative C2 and 24 percent lower than Alternative B.

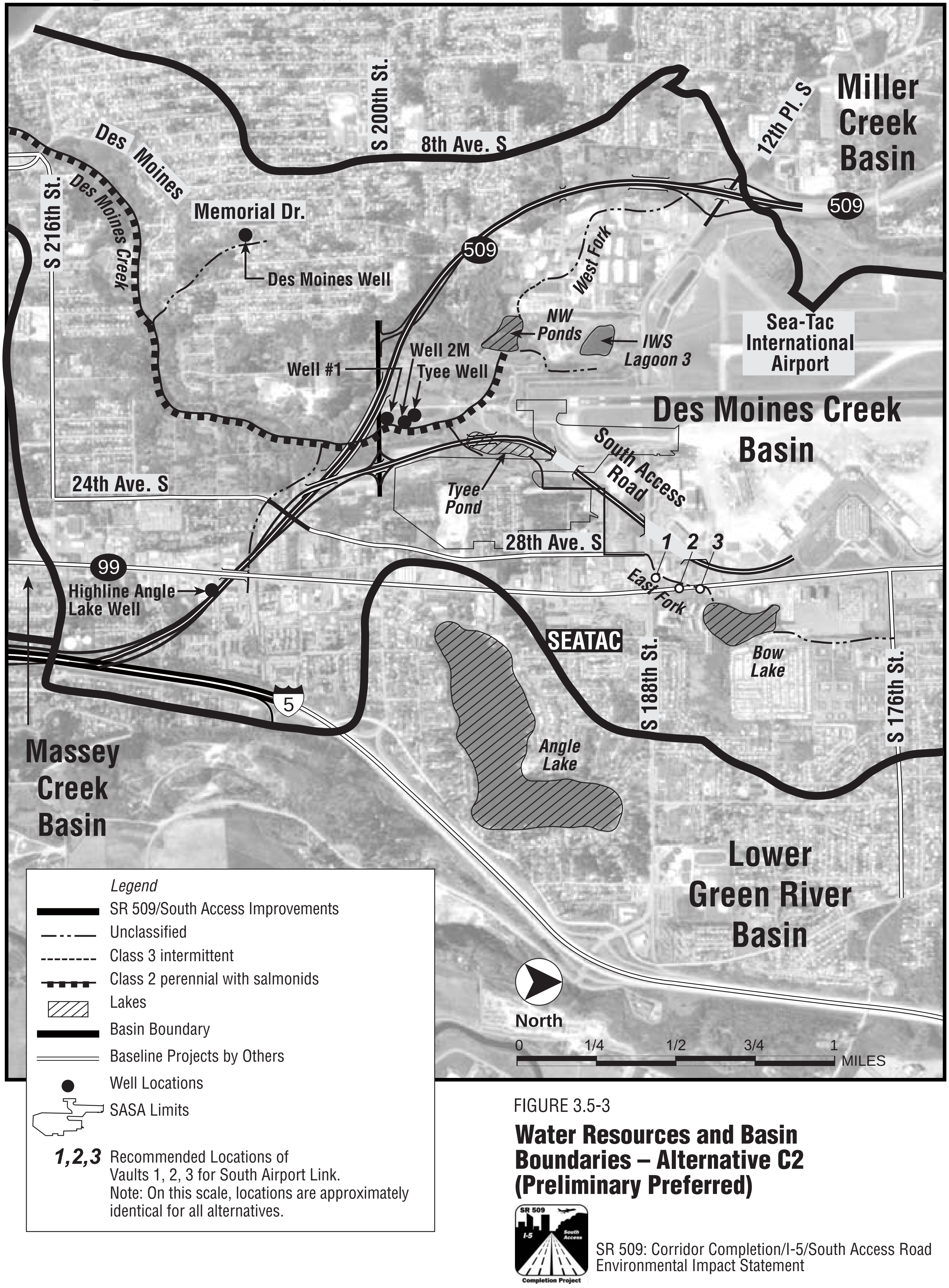


FIGURE 3.5-3

Water Resources and Basin Boundaries – Alternative C2 (Preliminary Preferred)

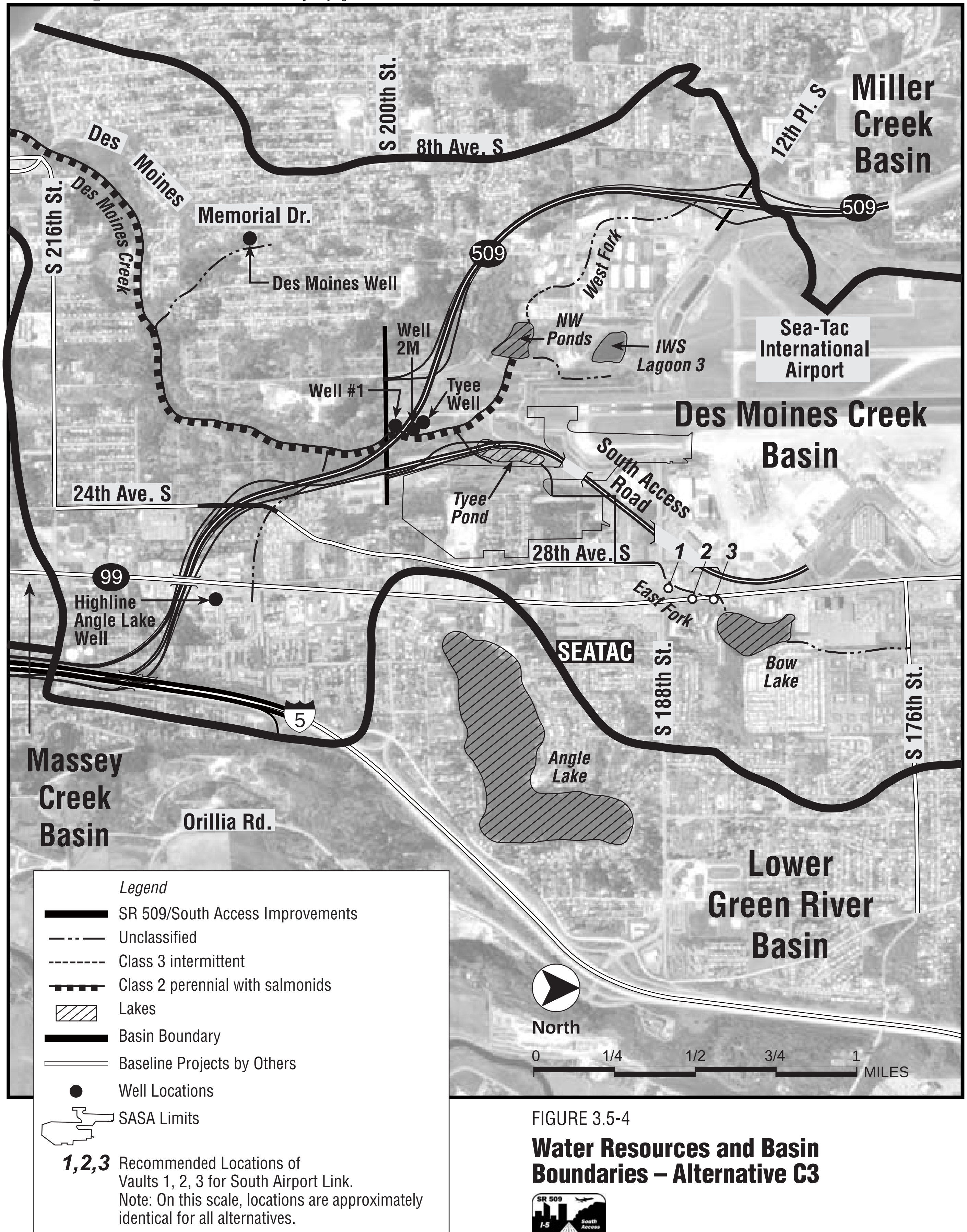


FIGURE 3.5-4

Water Resources and Basin Boundaries – Alternative C3

Potential impacts associated with the proposed South Airport Link design options and I-5 improvements are described under Impacts Common to All Build Alternatives.

3.5.4 Mitigation Measures

Project Design Mitigation Measures

Mitigation has been incorporated into the design of the build alternatives to reduce potential water quality impacts. Each of the alternatives incorporates King County's detention and water quality treatment criteria according to the King County basic water quality menu in the *Surface Water Design Manual* (King County 1998), as well as WSDOT Endangered Species Act (ESA) stormwater effects guidelines (WSDOT 1999). In addition, to increase the effectiveness of onsite surface water management, stormwater from the roadways would be managed separately from upstream surface water intercepted by the highway. Whenever possible, the build alternative alignments have been selected to avoid or reduce impacts on sensitive resource areas.

WSDOT would maintain stormwater management facilities for the proposed project, except for facilities at the South Access Road, which would be maintained by the Port of Seattle. WSDOT’s maintenance measures would follow RCP (WSDOT 1996) and the *Regional Road Maintenance Endangered Species Act Program Guidelines* (NMFS 2001). The IVM would promote use of native vegetation and reduced use of fertilizers, pesticides, and other controls. The visual quality policy would assume environmentally beneficial landscaping, use of water-efficient and runoff-reduction practices, and construction with minimal impact on habitat.

One of the goals of the *Des Moines Creek Basin Plan* (Des Moines Creek Basin Committee 1997) is to address elevated temperatures in Des Moines Creek. As part of the proposed project, trees and shrubs would be planted around detention ponds and along stream banks adjacent to the proposed alignment to provide shade and help lower stream temperatures.

As project design is further developed, opportunities to address stormwater issues using a watershed approach would be sought. This approach would focus on treating stormwater at the subwatershed level, emphasizing infiltration techniques and restoration of natural hydrological functions where practicable. A subwatershed scale analysis of existing soil types, geology, and land use cover, interfaced with the existing Des Moines Creek Basin Plan, would be used to identify such opportunities.

Operation Mitigation Measures

Operation mitigation measures would include operation and maintenance of stormwater management systems, implementation of an accidental spill response plan, and discriminate use of de-icing materials and herbicides for vegetation management within the highway right-of-way.

Stormwater Treatment Outfalls

Outfalls from proposed stormwater treatment facilities would be designed to dissipate the energy of the discharged water to prevent streambed scouring. Where practical, outfalls would be designed to improve fish habitat in the stream by including an alcove of low-velocity water. Such an alcove would provide refuge during high flows to overwintering juvenile and migrating adult salmonids (King County 1998).

Stormwater Management

Potential measures to mitigate operational impacts on water resources would include implementing design specifications from a number of existing plans and regulations, including WSDOT's NPDES permit for stormwater runoff. WSDOT has a Municipal NPDES permit that regulates and defines methods to manage, control, and treat runoff from highways and associated shoulders within the project area. Through the NPDES permit process, WSDOT is required to provide water quantity control and water quality treatment for all new and existing impervious surfaces to avoid or effectively mitigate impacts on water resources (WSDOT 1997). The proposed design criteria for the collection, detention, and treatment of stormwater will be according to the King County *Surface Water Design Manual* (King County 1998) and the WSDOT *Highway Runoff Manual* (WSDOT 1995). In cases where both manuals list design criteria, the more stringent design criteria will be used.

In general, standards and methods specified in the King County *Surface Water Design Manual* would be applied for designing stormwater BMPs. However, FAA design standards for airports place restrictions on the use of open water impoundments such as wet ponds and biofiltration swales because of their potential for attracting wildlife that could interfere with airport operations (FAA 1997). Project elements constructed by the Port on its property (e.g., South Airport Link) would be included under the airport's NPDES permit and appropriate controls and conditions for those facilities would be developed in conjunction with that permit.

Proposed stormwater treatment for the SR 509 freeway extension and the I-5 improvements primarily include vegetated bioswales, wet ponds, and detention ponds. A detailed description of the proposed stormwater treatment is provided in the *Stormwater Treatment Technical Memorandum for the SR 509/South Access Road* (CH2M HILL August 2001b) and in the *I-5 Corridor*

Improvements Drainage Facilities Concepts Technical Memorandum (CH2M HILL November 2001).

Vehicle access to stormwater and water quality treatment structures would be provided to allow I&M. The maintenance of all structures would be conducted according to the Stormwater Site Plan (SSP) prepared per WSDOT's *Highway Runoff Manual* (WSDOT 1995), WSDOT's RCP (WSDOT 1996), and King County's *Surface Water Design Manual* (King County 1998).

The outlets of facilities and interceptor swales would be designed to adequately dissipate the energy of discharged water before it reaches the receiving stream. Depending on the flow rates from the facility and the configuration of the system, this could be accomplished with a variety of structures, including rock pads, gabion outfalls, dispersion trenches, or level spreaders (King County 1998).

Accidental Spills Mitigation

To help control the spread of accidental spills during highway operation, the flow-control structures at stormwater detention facility outlets would be equipped with baffles and a spill-control separator to retain buoyant materials (lighter than water) such as petroleum products. Spilled liquids collected by the drainage system would thereby be detained in the stormwater detention facility until cleanup is complete.

Vegetation-Control Mitigation

Herbicide sprays to control vegetation would be applied only in dry weather under zero or mild wind conditions. In addition, spraying would be done only by a licensed sprayer. Precautions would be taken when spraying near sensitive water resources. Records would be maintained to keep track of the date, location, type, and amount of herbicides applied. Additional applicable guidelines for vegetation management, as outlined in WSDOT's RCP (WSDOT 1996), would be followed.

Bare or thinly vegetated ground surface areas within the right-of-way could be minimized, particularly on slopes. Where possible, grass vegetation could be used between the edge of pavement and roadside ditches and in earth-lined ditches to reduce erosion and encourage biofiltration of stormwater.

3.5.5 Construction Activity Impacts and Mitigation

Construction Impacts

Construction activities could introduce a variety of pollutants into surface waters, including sediment, fuel and lubricants, paving oils, chemicals, construction debris, and uncured concrete. Nutrients from seed mixtures applied for stabilizing soils and creating final landscaping have the potential to reach adjacent water resources.

Potential construction impacts on groundwater quality would include a range of pollutants used or generated during construction, such as petroleum products and construction waste. Pollution could result from (1) accidental release of these substances, (2) leaking storage containers, or (3) construction equipment maintenance. The potential for construction impacts would be low because of the short period of construction and implementation of BMPs.

Construction might affect the wellhead protection area of the Angle Lake Well. The Angle Lake Well and other wells in the project area are within the South King County GWMA. However, management strategies to protect the wellhead area are in a 5-year development phase and are not yet finalized (Johnson pers. comm. 2000). Whenever the BMPs become available, they will be incorporated into the protection plan. In the meantime, BMPs outlined in the King County *Surface Water Design Manual* (King County 1998) and WSDOT's *Highway Runoff Manual* (WSDOT 1995) would be used.

Mitigation Measures

Local, state, and federal government permit requirements would be implemented to mitigate potential construction impacts on surface and groundwater resources for all build alternatives. Stormwater, grading, and water quality-related permits required for the proposed project could include Hydraulic Project Approval (HPA), NPDES Permits for Construction and Operation of Sites Disturbing More Than 5 Acres, NPDES Permits For Construction Activity for Sites Greater than 1 Acre (Phase II of the NPDES Stormwater Program [U.S. EPA December 1999]), and local clearing, grading, and other permits.

To fulfill requirements of the construction NPDES permit, an SSP would need to be developed. The SSP would include measures for controlling erosion and sedimentation and preventing discharge of pollutants contained in stormwater to water bodies during construction and operation. The SSP would also include provisions for implementation of BMPs to protect groundwater and public drinking water supply, and measures to protect water and sewer lines, and construction monitoring. In developing the SSP, detailed data collection and analysis of local site conditions would be conducted. This would incorporate a thorough soils assessment, including jar tests, to determine potential for erosion and persistent water turbidity. Other site specific information on drainage, topography, ground cover, rainfall records, existing encumbrances, and water table elevation would be used in developing a Temporary Erosion and Sediment Control (TESC) plan.

The TESC plan is a required component of the SSP. In developing the TESC plan, appropriate construction BMPs would be selected for each of the particular types of anticipated construction activities. Implementing effective BMPs at construction sites, such as minimizing exposed soil surfaces and controlling erosion and sedimentation, would prevent or reduce potential impacts on surface water and groundwater quality. The King County *Surface Water Design Manual* (King County 1998) and WSDOT's *Highway Runoff Manual* (WSDOT 1995) would be used for BMP selection and design criteria. BMPs for the types of construction activities anticipated typically include the following:

- Phasing construction to minimize the amount of earth exposed at any one time to erosive forces
- Designing construction entrances, exits, and parking areas to reduce tracking of sediment onto public roads
- Using vegetative erosion-control practices (seeding, mulching, soil conditioning with polymers, flocculants, sod stabilization, vegetative buffer strips, and protection of trees with construction fences)
- Implementing erosion-control practices (mulching, erosion-control blankets, and application of soil tackifiers)
- Implementing sediment-control practices (straw bales, silt fences, check dams, sediment traps, sedimentation basins, and flocculation methods)
- Controlling erosion of stockpiled materials (e.g., diverting upslope water around stockpiles, covering stockpiles, and placing silt fences around stockpiles)
- Preserving the permeability of pervious areas within the project construction site to the greatest extent practical
- Performing routine I&M of erosion and sediment control BMPs.

If construction takes place during the wet season (October 1 through April 30), exposed soils would be subjected to additional controls specified in King County's erosion and sedimentation control standards (King County 1998).

A Spill Prevention Control and Countermeasures (SPCC) plan would be adopted as a construction planning element of the proposed project to reduce accident-related water quality impacts (Wilson pers. comm. 1999). The plan would specify the responsibilities of those involved during accidental spills.

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